Efficacy of an internet program for smoking cessation during and after inpatient rehabilitation treatment: a quasi-randomized controlled trial

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Abstract: OBJECTIVE: To test the feasibility and efficacy of an internet program for smoking cessation during and after inpatient treatment in rehabilitation centers. METHODS: A total of 7574 consecutively admitted inpatients from three German rehabilitation centers were assessed for smoking status. Daily smokers or former daily smokers who regularly used the internet and e-mail were proactively invited for study participation. Out of 749 eligible patients, 477 (64%) participated in the study and were randomly assigned to an intervention or an assessment only control group based on the calendar week of admission. Patients of the intervention group had the possibility to use an internet program for smoking cessation for a period of six months. The program provided at least one but up to seven individual counseling sessions through a computer expert system, informational websites and a message board. RESULTS: At six-months follow-up, seven-day point prevalence smoking abstinence was twice as high in the intervention group as in the control group (OR=2.0; CI 1.1-3.8; p=.02). CONCLUSIONS: Proactive recruitment of smokers in combination with the provision of an internet program for smoking cessation allow for an inexpensive and effective smoking cessation support during and after inpatient rehabilitation treatment.

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Efficacy of an Internet program for smoking cessation during and after inpatient rehabilitation treatment: a quasi-randomized controlled trial

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Abstract

Objective: To test the feasibility and efficacy of an Internet program for smoking cessation during and after inpatient treatment in rehabilitation centers. *Methods:* A total of 7574 consecutively admitted inpatients from three German rehabilitation centers were assessed for smoking status. Daily smokers or former daily smokers who regularly used the Internet and e-mail were proactively invited for study participation. Out of 749 eligible patients, 477 (64%) participated in the study and were randomly assigned to an intervention or an assessment only control group based on the calendar week of admission. Patients of the intervention group had the possibility to use an Internet program for smoking cessation for a period of six months. The program provided at least one but up to seven individual counseling sessions through a computer expert system, informational websites and a message board. *Results:* At six-months follow-up, seven-day point prevalence smoking abstinence was twice as high in the intervention group as in the control group (OR=2.0; CI 1.1-3.8; *p*=.02). *Conclusions:* Proactive recruitment of smokers in combination with the provision of an Internet program for smoking cessation allow for an inexpensive and effective smoking cessation support during and after inpatient rehabilitation treatment.

Keywords: Smoking cessation, Internet, inpatient treatment

1. Introduction

Smoking cessation interventions reduce mortality of patients with lung cancer, respiratory or cardiovascular disease (Anthonisen, et al., 2005). Even after orthopedic or surgical operations, recovery could be promoted by smoking cessation (Lindstrom, et al., 2008; Moller, Villebro, Pedersen, & Tonnesen, 2002). However, only a small proportion of patients are abstinent at the end of inpatient rehabilitation treatment and long-term maintenance of abstinence rarely succeed (Metz, et al., 2007).

Brief advice delivered by physicians resulted in a small but significant effect on smoking cessation rates (Lancaster & Stead, 2004). However, lack of time and training, inadequate reimbursement, and insufficient patient motivation to change have all been reported as major barriers to the success of smoking cessation interventions provided by healthcare professionals (Cornuz, Ghali, Di Carlantonio, Pecoud, & Paccaud, 2000; Twardella & Brenner, 2005; Vogt, Hall, & Marteau, 2005) . Computer-generated smoking cessation interventions are time-saving alternatives to interpersonal counseling and may be crucial for implementing smoking cessation interventions in health care institutions.

Communication technologies allow for extending the temporal and geographical reach of smoking cessation interventions of inpatient treatment providers and may support intervention maintenance rates. Within a study in inpatient rehabilitation, patients either received telephone booster sessions or no treatment after intensive inpatient smoking cessation treatment (Metz, et al., 2007). The telephone booster sessions significantly improved the maintenance of smoking abstinence.

So far, the effectiveness of Internet smoking cessation programs was tested primarily in smokers with an intention to quit smoking and in younger samples of smokers in the age range of 20-40 years (Shahab & McEwen, 2009). However, in recent years, Internet use has particularly increased in older people. Patients being treated in rehabilitation centers are primarily aged 40 years and older, with a substantial part of patients not motivated to quit smoking. This study tested the efficacy of an Internet intervention for smoking cessation in a proactively recruited sample of patients receiving rehabilitation treatment.

2. Methods

2.1 Setting

The efficacy of the Internet intervention was tested at three German inpatient rehabilitation centers. Patients receive rehabilitation treatment after acute care because of various acute

(e.g., stroke, coronary heart disease, cancer) or chronic disorders (e.g., diabetes, athma) in order to regain their ability to work. A total of 6 rehabilitation centers in Mecklenburg-Western Pomerania, were contacted and informed about the project. Three rehabilitation centers agreed to participate in the study.

2.2 Design and procedure

The efficacy of the intervention was tested in a quasi-randomized controlled trial with one follow-up assessment after 6 months. All consecutively admitted patients in the participating rehabilitation centers were assessed by a medical doctor or by the nursing staff regarding the inclusion criteria Internet use, e-mail use, and cigarette smoking. Patients, who (1) smoked at least one cigarette per day or were abstinent for a maximum of six months and smoked at least one cigarette per day before and (2) used the Internet and e-mail at least every two weeks, received an appointment date in their treatment schedule. During this appointment, a study assistant invited the patients personally to participate in the study. All participants, irrespective of participation in other smoking cessation interventions provided by the rehabilitation centers, were invited. Subsequently, patients who provided informed consent for study participation were assigned to an intervention or an assessment only control group. To minimize spill-over effects, patients with admission at a given calendar week were assigned to the same study condition. A baseline assessment was conducted online for patients in both study groups. Six months after admission to the rehabilitation center, immediately after the end of the intervention period, all study participants were followed-up via computer assisted telephone interviews. The study was approved by the ethics committee of the University of Greifswald.

2.3 Intervention

“Rauchberatung.de” is an Internet-based program that could exclusively be used by registered patients of the participating rehabilitation centers. Following the online baseline assessment, patients of the intervention group had access to the program for a period of six months. The program consisted of three complementary modules: individual advice provided by a computer expert system, information websites, and a message board.

The program offered up to seven individual counseling sessions by an expert system: one during the stay at the rehabilitation center and up to six after discharge. When accessing the online expert system, participants were asked to answer 11-14 questions depending on the individual smoking status and stage of change according to the Transtheoretical Model (TTM)

(Prochaska & Velicer, 1997). The current use of different self-change strategies was measured using the German version (Tönjes, et al., 2007) of a scale developed by Etter et al. (Etter, Bergman, & Perneger, 2000). Furthermore the number of cigarettes smoked per day and recent quit attempts were assessed in current smokers.

Using these data, the expert system generated an individual feedback letter. The first letter, which was based on data gathered at the baseline assessment, included feedback that depended on the individual scores compared to the population norm by stage. The subsequent letters additionally included feedback that was tailored to individual change since the previous assessment of the different constructs. Program participants received their first online feedback letter immediately after baseline assessment. After discharge from inpatient rehabilitation, the system invited the program participants monthly via e-mail to use the online counseling system. The participants received the resulting feedback letters online and via e-mail.

Information websites provided further advice and background information in addition to the individual feedback letters of the expert system. Depending on the individual stage of change, participants were linked to specific Internet information sites within the online feedback letter. A message board was provided on the website. It offered exchange with other program participants, and to discuss personal experiences and strategies for smoking cessation.

2.4 Measures

The baseline assessment gathered demographic, health- and smoking related data. *Stage of change* was assessed using the staging algorithm of the TTM (DiClemente, et al., 1991). *Nicotine dependence* was assessed using the Fagerström Test for Nicotine Dependence (FTND) (Heatherton, Kozlowski, Frecker, & Fagerström, 1991). *Smoking cessation self-efficacy* was assessed using a 9-item scale (Jäkle, Keller, Baum, & Basler, 1999; Tönjes, et al., 2007). Smokers indicated their confidence in not smoking in positive social situations, in negative affect situations, and in habitual or craving situations.

Main outcome criterion was 7-day point prevalence smoking abstinence (i.e. not having smoked even a puff for a period of 7 days) preceding the 6-months follow-up. Four-week point prevalence abstinence preceding the follow-up was used as a secondary outcome criterion.

2.5 Data analyses

Binary logistic regression analyses were used to compare the smoking abstinence rates between the study groups. Baseline characteristics which differed between the study groups as well as a variable denoting the rehabilitation center were included as covariates in the logistic regression models. We conducted intention to treat analyses. All participants who did not provide follow-up data were treated as continuing smokers. Complete case analyses were carried out using only the subgroup of study participants with non-missing data concerning smoking-abstinence at follow-up assessment. An alpha level of 0.05 (two-tailed) was chosen for all statistical tests in this study.

3. Results

3.1 Study participants

The flow of study participants is depicted in Figure 1. A total of 7574 consecutively admitted patients of three rehabilitation centers were assessed for smoking status between November 2008 and December 2009. Out of the 749 patients meeting the inclusion criteria for study participation, 477 (64%) participated in the study. From these, 242 were allocated to the intervention group and 235 were allocated to the control group. Follow-up assessments could be realized in 214 participants (88%) of the intervention group and in 217 participants (92%) of the control group. The baseline characteristics of the study participants are displayed in Table 1.

3.2 Program use

After discharge from inpatient treatment, individual advice provided by the expert system was retrieved by 101 (42%) of 242 program participants. Among users of the expert system, the median number of retrieved feedback letters after discharge from the rehabilitation center was 2. All six feedback letters after discharge were retrieved by 16 participants (7% of all program participants). A total of 113 program participants (47%) logged in to the message board at least once. Two participants (1%) created own postings and published those on the message board.

3.3 Efficacy

Using data of all study participants (intention to treat), 7-day point prevalence abstinence rates were 11.1% (26/235 participants) in the control group and 23.6% (57/242 participants) in the intervention group. Considering the differing numbers of participants with initial smoking

abstinence at baseline, the percentage of 7-day point prevalence abstinence decreased from baseline to follow-up by 1.7 percentage points in the control group, and increased by 5.4 percentage points in the intervention group. Binary logistic regression analyses, controlling for rehabilitation center, baseline stage of change, and baseline self-efficacy, resulted in higher 7-day point prevalence abstinence rates in the intervention group compared to the control group (OR=2.0; 95% Confidence Interval (CI) 1.1-3.8; p=.02).
Regarding 4-week point prevalence abstinence, 26 of 235 participants (11.1%) in the control group and 55 of 242 participants (22.7%) in the intervention group were abstinent at follow-up. Binary logistic regression analyses also resulted in higher 4-week point prevalence abstinence rates in the intervention group compared to the control group (OR=2.0; 95% CI 1.1-3.7; p=.03).

4. Discussion

This study tested the efficacy of an Internet intervention for smoking cessation in a proactively recruited sample of patients receiving rehabilitation treatment. After six months, the group of patients participating in the Internet program achieved abstinence rates that were twice as high as those in the control group. This efficacy is comparable to the study by Metz et al. (2007) who tested the efficacy of telephone booster sessions to promote smoking abstinence after discharge from rehabilitation centers. However, much less time and effort are required for the implementation of the Internet program tested in this study. The questions concerning tobacco smoking on treatment admission may be considered as belonging to the routine admission procedure. Introduction to the program took about 10 minutes per patient. The subsequent dispatch of regular invitations to attend the counseling expert system was fully automated by e-mail.
Proactive, personal invitation for study participation in combination with the offer of a low-threshold intervention allowed for reaching the majority (64%) of smoking patients with regular Internet and e-mail usage. This proportion of participants among all target persons is substantially higher than the reported participation rates in group counseling for smoking cessation in inpatient rehabilitation treatment (38% (Flöter, et al., 2007)). Particularly, the high proportion of smokers in the precontemplation stage of change underlines one main advantage of this intervention approach.
The data on program use show that nearly half of the program participants (42%) use individual expert system advice at least once after discharge from the rehabilitation center. Considering the high proportion of participants in the precontemplation stage and the fact that

no personal invitation but an automatically generated invitation by e-mail was sent to the participants, this number of program users is satisfactory. The ability to send own postings to the message board was only used by a few program participants.

Some study limitations should be mentioned: first, only about one-third (37%) of smoking patients in the participating rehabilitation centers regularly used the Internet and e-mail and thus met the requirements for study participation. Second, the results presented are restricted to initial efficacy, i.e. they are based on one follow-up assessment immediately after the end of the program. Third, we did not biochemically verify smoking status at follow-up assessment.

5. Conclusions

Proactive recruitment of smokers in combination with an invitation to our Internet program allow for an inexpensive and effective support of smoking cessation during and after inpatient rehabilitation treatment. The Internet program could also be used as a complement to smoking cessation counseling services and as a low-threshold offer to patients who are not yet sufficiently motivated to participate in more intensive smoking cessation interventions.

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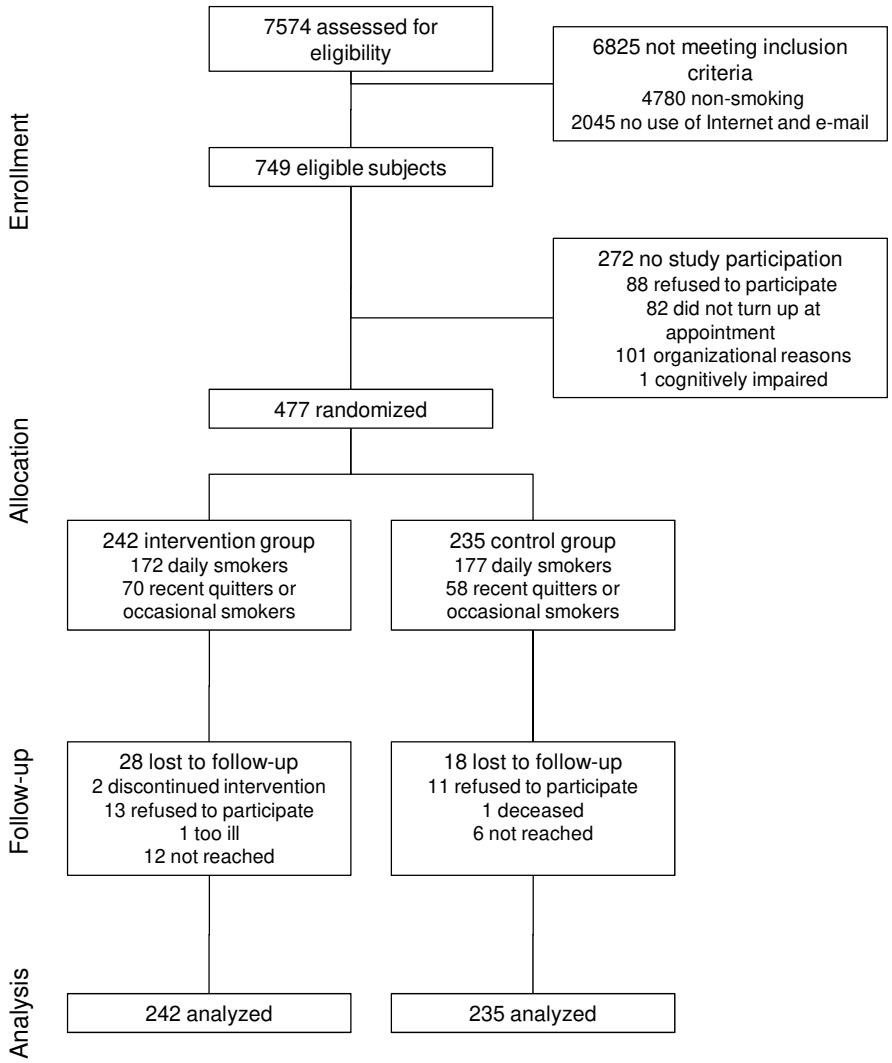
Table 1: Baseline characteristics of study participants. Values are numbers (percentage) unless stated otherwise.

Total sample	Control group N=235	Intervention group N=242	Total N=477	*p**
Gender				.13
Female	114 (48.5)	134 (55.4)	248 (52.0)	
Male	121 (51.5)	108 (44.6)	229 (48.0)	
Age, *M (SD)*	45.9 (9.6)	47.0 (9.9)	46.5 (9.8)	.21
School education				.33
< 10 years	38 (16.2)	33 (13.6)	71 (14.9)	
= 10 years	131 (55.7)	135 (55.8)	266 (55.8)	
> 10 years	61 (26.0)	71 (29.3)	132 (27.7)	
No information	5 (2.1)	3 (1.2)	8 (1.7)	
Living in stable partnership				.22
Yes	163 (69.4)	180 (74.4)	343 (71.9)	
No	72 (30.6)	62 (25.6)	134 (28.1)	
Self-rated global health				.74
Excellent	5 (2.1)	2 (0.8)	7 (1.5)	
Very good	20 (8.5)	14 (5.8)	24 (7.1)	
Good	110 (46.8)	132 (54.5)	175 (50.7)	
Fair	79 (33.6)	78 (32.2)	111 (32.9)	
Poor	21 (8.9)	16 (6.6)	32 (7.8)	
Clinic ward				.42
Orthopedy	104 (44.3)	83 (34.3)	187 (39.2)	
Internal medicine	39 (16.6)	50 (20.7)	89 (18.7)	
Psychosomatics	43 (18.3)	37 (15.3)	80 (16.8)	
Oncology	14 (6.0)	16 (6.6)	30 (6.3)	
Dermatology	20 (8.5)	24 (9.9)	44 (9.2)	
Pneumology	8 (3.4)	5 (2.1)	13 (2.7)	
No information	7 (3.0)	27 (11.2)	34 (7.1)	
Smoking status				.22
Daily smoking	177 (75.3)	172 (71.1)	349 (73.2)	
Occasional smoking/ < 7 days abstinent	28 (11.9)	26 (10.7)	54 (11.3)	
≥ 7 days abstinent	30 (12.8)	44 (18.2)	74 (15.5)	
Smoking cessation self-efficacy, *M (SD)*	2.8 (1.0)	3.0 (1.1)	2.9 (1.0)	.03
No information	1 (0.6)	0 (0)	1 (0.3)	
Stage of change				.00
Precontemplation	111 (47.2)	72 (29.8)	183 (38.4)	
Contemplation	70 (29.8)	89 (36.8)	159 (33.3)	
Preparation	16 (6.8)	23 (9.5)	39 (8.2)	
Action	38 (16.2)	58 (24.0)	96 (20.1)	
Daily smokers only	Control group 177	Intervention group 172	Total 349	*p**
Nicotine Dependence (FTND), *M (SD)*	3.3 (2.1)	3.3 (2.0)	3.3 (2.1)	.75
No information	1 (0.6)	0 (0)	1 (0.3)	
Number of cigarettes smoked per day, *M (SD)*	13.9 (6.9)	14.3 (7.5)	14.1 (7.2)	.54
Quit attempt in previous year				.21
Yes	52 (29.4)	62 (36.0)	114 (32.7)	
No	125 (70.6)	110 (64.0)	235 (67.3)	

Notes: *Comparison of intervention and control group; χ^2-tests for categorical variables, Mann-Whitney-U-tests for ordinal variables, t-tests for continuous variables. FTND = Fagerström Test for Nicotine Dependence.

Figure captions

Figure 1: Flow of study participants


Enrollment
7574 assessed for eligibility
6825 not meeting inclusion criteria
4780 non-smoking
2045 no use of Internet and e-mail
749 eligible subjects
272 no study participation
88 refused to participate
82 did not turn up at appointment
101 organizational reasons
1 cognitively impaired
Allocation
477 randomized
242 intervention group
172 daily smokers
70 recent quitters or occasional smokers
235 control group
177 daily smokers
58 recent quitters or occasional smokers
Follow-up
28 lost to follow-up
2 discontinued intervention
13 refused to participate
1 too ill
12 not reached
18 lost to follow-up
11 refused to participate
1 deceased
6 not reached
Analysis
242 analyzed
235 analyzed